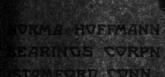
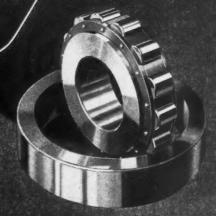
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Courtesy of The Lodge & Shipley Machine Tool Co., Cincinnati, Ohio

OGAN equipment on this Lodge & Shipley Duomatic Lathe again proves its dependability and high efficiency. The LOGAN compensating 3-Jaw Chuck, Model "R" Cylinder, and Air Operated Tail-stock Center Device combine to provide a quick, accurate, and positive means for holding or driving for machining operations.

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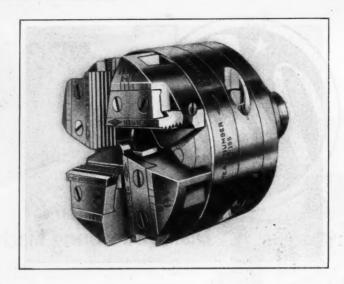
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Modern Stop

HOWARD CAMPBELL, Editor

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Other tool holders come and go, but ARMSTRONG Tool Holders remain the standard—the choice of over 96% of the machine shops and tool rooms—for each is an efficient tool, designed and manufactured by the tool holder specialists; each is a tried tool, tested and proved in a world-wide testing laboratory. There is nothing experimental about ARMSTRONG Tool Holders.

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OCTOBER, 1932

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Vol. 5, No. 5

C. & O. Shops at Huntington Are Well Equipped

Many special tools and devices have been developed to expedite locomotive repairs

By HOWARD CAMPBELL

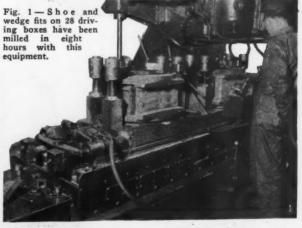
IF ONE may judge from the number of special tools and devices that have been developed to expedite locomotive repairs at the Huntington, W. Va., shops of the Chesapeake & Ohio Railway, these shops rank among the best in the country in point of efficiency. A few of the more interesting tools are presented here.

The illustration Fig. 1 shows the

operation of milling the shoe and wedge fits on driving boxes. The machine is a planer - type miller, equipped with two side heads which drive milling cutters that mill both shoe and wedge faces as well as the inside faces of the box flanges simultaneously, the taper in the box flanges being cut at the same time.

The boxes are clamped on an auxil-

iary reversible table, mounted on the table of the machine. Thus the operator can change the piece on one end of the table while the piece on the opposite end is in process of being milled. The auxiliary table is locked in position by means of an air clamping device, connected to the shop airline. The clamps that hold the boxes to the table are mounted on square



thread screws of large diameter which are screwed up or down by means of pins that are inserted into holes in the heads. The average time for milling shoe and wedge faces and the insides of flanges on new driving box castings is approximately two hours per box, depending upon the condition of the castings and the amount of stock to be removed. However. 28 boxes have been milled with this equipment in eight hours, although in this instance the shoe and wedge faces were of cast bronze and the boxes were all of the same size. necessitating no change in the size of the cutters.

In Fig. 2 is shown a Newton planertype miller set up to mill shoes and wedges. The pieces are held in fixtures located on an auxiliary reversible table that is mounted on the table of the machine in the same manner as that shown in Fig. 1. There are two fixtures on each end of the table. which makes it possible for the operator to change two pieces while the other two are in process. The milling is done with a set of four insertedtooth side milling cutters and two sets of interlocking cutters, the pieces being finished at one pass. With the equipment shown, from 45 to 60 pieces are completed in eight hours.

All side rod bushings are made with expansion grooves onequarter inch wide and from one-quarter to

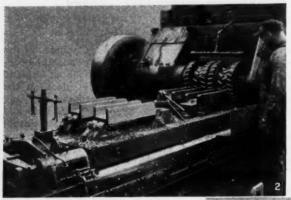


Fig. 2—The production on this job is from 45 to 60 pieces in eight hours. Fig. 3—Drawing of side rod bushing with expansion grooves. Fig. 4—Using a Morton keyseating machine to cut expansion grooves in side rod bushings.

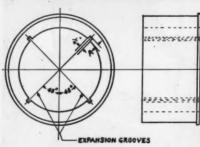
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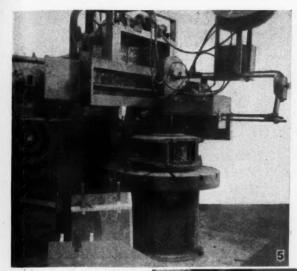


ALL SIDE ROD & USWINGS TO MAVE

THICKNESS OF BUSHING	GROOVE A
IN BUNDER	4.
1" TO 14"	3/8"
I FILE OVER	12"



2



reclaimed by welding on a layer of bronze. In order to apply the bronze evenly and at the fastest possible speed, an automatic welding machine has been made by equipping an old boring mill with a reverse polarity electric welding machine, as shown in Fig. 5. The metal, which forms the electrode, comes in the form of a wire that is coiled about the spool shown at the top in the illustration, and is fed automatically.

The speed of the

Fig. 5—Automatic welding machine made by equipping an old boring mill with an electric welder, and used to apply bronze electrodes to the worn hub faces of driving boxes. Fig. 6—Driving boxes to which bronze has been applied.

one-half inch deep, depending upon the thickness of the bushing, as indicated in the drawing Fig. 3. These expansion

grooves are cut in with the aid of the Morton keyseater shown in operation in Fig. 4. This machine is of the vertical type and the pieces are held, two at a time, in a universal chuck which can be indexed so that the grooves will be cut in the proper locations. A single cutter is used and four grooves, from three-eighths to seven-sixteenths inch deep, can be cut in two bushings in four minutes.

When the hub faces of driving boxes become badly worn, they are

table can be regulated to obtain the best results, and the feed of the electrode is contingent upon the speed of the table. In the tests that have been made thus far, it has taken two hours to apply a layer of bronze to a hub face 22 in. in diameter, but it is estimated that when the arrangement is fully completed, the operation can be performed in less than an hour.

Bronze is also applied to the ends of crosshead shoes and gibs, thus helping to reduce the wear on the



Fig. 7-Aligning cylinders and setting guides, using the device illustrated in Fig. 8 and 9.

guides and assisting to hold the soft metal in place. It is also applied around link cheeks and to the inside faces of crank arms, making it possible to recondition these pieces indefinitely. Some of the driving boxes to which the bronze electrode has been applied by the use of the automatic equipment are shown in Fig. 6.

The operator shown in Fig. 7 is aligning cylinders and setting guides, using a special device that has been developed for the purpose in this shop. The device consists principally of two lengths of steel wire, held at each end in such manner that they can be adjusted in any direction. One end of each wire is attached to a centering device that is bolted to the front end of the cylinder as shown in Fig. 8, the wire being passed through a 1/32-in. hole in the center of a steel spool, where it is anchored. spool is held by four screws, each 1/2in. dia. by 2½-in. long, to which handwheels are attached. The end of each screw is turned to fit into a groove in

the periphery of the spool; thus it is possible, by manipulating the screws, to locate the spool in the exact center of the cylinder bore.

The opposite end of the wire passes over a pulley on the upper end of a support consisting of the vertical piece A, Fig. 7, which is attached to



Fig. 8—One end of the wire is located central with the bore of the cylinder.

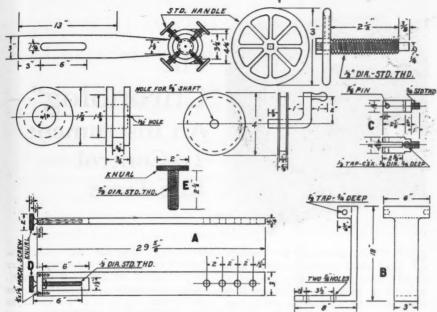


Fig. 9-Some of the major details of the aligning fixture.

a "foot" B that is bolted to a plank. As there are two wires, with two sets of holders, the "feet" are bolted to the plank so that they will be the correct distance apart when the plank is laid across under the engine. The pulley revolves in a slot in a block C, which can be adjusted vertically by means of a knurled-head screw D, 6½ in. long. The lower end of the upper section is bolted to the foot, from

which it extends vertically between two adjusting screws E that are used to adjust it sidewise. Thus the wires can be adjusted to the exact location required. With both ends of the wires at the correct height and the correct distance apart, all the necessary measurements can be taken easily. Some of the details of the fixture are shown in the drawing Fig. 9.

(This article will be concluded in the November issue.)

Carboloy Announces Cost Saving Plan

A new plan to reduce the cost of Carboloy cemented carbide metal cutting tools has been recently announced by the Carboloy Company, Inc., 2485 E. Grand Boulevard, Detroit, Michigan. The plan is known as their "Milled and Brazed Service." Milled and brazed Carboloy tools are the same as the regular finished tool except that they require a small amount of grinding to put into operation. By taking advantage of this service, the

user can obtain Carboloy tools at less than the regular finished tool price and save a large part of the difference in cost.

Although the "Milled and Brazed Service" has just recently been announced, it has been in use for an extended period of time by a number of representative plants and the economical results obtained indicate that it can be profitably adopted by both large and small cemented carbide users. Complete descriptive literature on this cost saving plan is available on request to this company.



The "Chronolog" An Instrument To Control Idle Time

CINCE the beginning of the "machine age" plant managers have wondered-more or less-why the actual production seems to be so small in comparison to the possible production, and what actually causes the apparently endless delays to productive equipment. In most cases the delays are so numerous that it is practically impossible for anyone to list, at the end of the working day, the reasons why the machine was idle in each of the various instances; such a tabulation would have to be made at the time of starting and stopping the machine. Such procedure would obviously be too costly to maintain as a regular part of the shop routine, unless the task could be turned over to a mechanical tabulator - and such a tabulator has been lacking up to this time.

Now, however, after several years of development and test under shop conditions, an instrument has been developed that provides a visible record of the productive time for the day and of the idle time that has accumulated during the day or the run, and furnishes a count of the units produced, whether they are yards of material, cans of liquid, or pieces pro-

duced by a machine tool. It can be applied to machine shop equipment or to packaging machines; it is practically universal in its applications. The instrument, which is to be known as the "Chronolog," was developed and is being built by the National Acme Co., Cleveland, Ohio, and will be marketed by the Graybar Electric Co.

The Chronolog may be applied to practically any machine or device which is subjected to interruption,



"Chronolog" installation on Sundstrand Stub Lathe at plant of Cleveland Graphite Bronze Company.

and gives in visual form a constant record of the performance of the machine. It is usually mounted on the machine or on a pedestal within the

"Best Wheels We Ever Had for Centerless Grinding"

That's the Statement in Report After Report

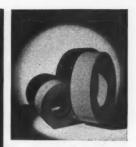
T'S what grinding room foremen and production superintendents in many plants are saying—men who are interested only in results... in lower costs from their machines. They are saying it because in competitive tests in their own shop Norton wheels are actually lowering centerless grinding costs—by faster production, better finish, longer life, fewer dressings—and no duplication difficulties... the same grinding action in wheel after wheel.

NORTON COMPANY

e

WORCESTER, MASS.





Largely responsible for the success of Norton wheels for centerless grinding are Controlled Structure and "B" Bond. A description of their features is available. Write for a copy—no obligation.

W-428 A





"Chronolog" installation on tolerance gage in inspection department at The National Acme Company's plant. The Chronolog automatically counts the pieces inspected. Production increased from 350 pieces per hour (two operators) to 600 pieces per hour in three weeks.

reach of the operator. The record is made on a chart which moves continuously throughout the working

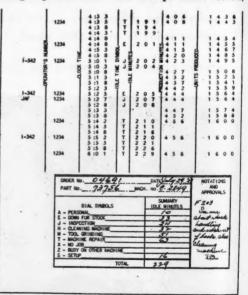
period, and which bears the operator's number, the actual clock time, the idle time symbol and record of idle minutes, the productive minutes, and the number of units produced. The latest notations on the chart are visible through a window in the front of the instrument.

The operator puts the Chronolog to work by inserting a key in a slot and turning the switch to "on." The Chronolog immediately prints the time to the minute, and records the fact that the indicators have been reset to zero. From that time on, without further attention, the Chronolog records, at fixed intervals, the information listed above. The indicators are easily visible to the operator and by glancing at them from time to time he can see how the idle

minutes and productive time compare. Should he be interrupted for any reason, he turns the dial to one of several letters indicating the reason, as follows: P—production; A—personal; B—down for stock; C—inspection; D—cleaning machine; E—tool grinding; F—machine repair; G—no job; H—busy on other machine; S—set up.

When the operator turns the dial to the reason for idle time, a signal lamp l ghts, giving warning to the foreman that the machine is idle. The Chronolog prints the time to the minute that the interruption occurred, prints the letter defining the reason, and starts adding the idle minutes. It also ceases adding productive minutes. When ready to resume production, the operator pushes the reset button, which brings the dial back to production.

In addition to keeping the operator constantly informed, the Chronolog presents a detailed printed record,



Bottom of "Chronorecord" showing form of report which goes to foreman, superintendent, manager, and so on, showing causes of idle time.

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called the "Chronorecord," to the foreman or superintendent. This record reveals precisely when an interruption occurred, why it occurred, and how long it delayed normal production. The Chronolog also produces any desired number of "Chronocards" on

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supervisor, inspector, machine repair man, stock man or electrician, thus recording the activity of those who have a definite influence on the output of the equipment, but who are not under the operator's control.

Installations on various types of

production machines and equipficant bearing up-

on the production policy.

ment during the past vear prove that productive activity is increased by the Chronolog from 20 to 83 per cent, production costs are reduced, and the earnings of the operator are augmented in proportion. These results are quite naturally reflected in manufacturing costs and earning statements and have. therefore, a signi-

Front and reverse side of "Chronocard" which can be sent to pay-roll. production, time study, or other departments which need an explicit record of progress made on the machine.

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covery Nous Cap 4/2 Charling Machine

which are summarized the total idle time, total productive time, and units produced. These may be routed to timekeeper, time study and production departments.

With this explicit data available, every one concerned is advised as to the seriousness of the various causes of interruption and definite steps can be taken to reduce them. The data is available long before the usual cost figures can be compiled, and enable the management to improve the situation during the run instead of waiting for a post mortem after the work is completed.

The "Chronorecord" indicates to the minute the time the operator actually starts and stops his work, and the arrival and departure of foreman,

The Chronolog holds great promise in its capacity to deal with the problem of idle time, and to give management the means of establishing control over it. Industrial engineers who have investigated the Chronolog at work are confident it will be a great boon to time study and rate setting departments, and will put in the hands of industrial management a new and powerful instrument for better production control.

The most progressive manufacturer can give you the best service. manufacturers represented here among the leaders in their industry; patronize them and mention MODERN MACHINE SHOP when doing so.

Planning For Production

By A. HECKMAN

Superintendent Buildings, Light, Heat and Power, Westinghouse Electric & Mfg. Co.

THE present economic situation has given many of us an entirely new slant on "planning for production." Up to the time of the recent depression, attention was riveted on a normal output which was usually not far below capacity. In many cases this

meeting production demands with little regard for manufacturing costs.

Under present conditions the picture may be the same, but the frame has been changed entirely. Normal production is hoped for but hardly expected in the near future. Capacity

output would be the millennium. Individual costs are commanding the concentrated attention of executives and engineers alike. A new installation or a revision of the present plant layout is not seriously considered unless costs will be reduced at the present rate of output regardless of whether that rate is twenty-five, fifty or one hundred per cent of the so-called



Instrument and control switch assembly. Production 1,500 switches per month with 6 operators.

made the prorated cost practically

It was assumed that parts would be built for stock and a uniform rate of production was maintained. This stock served as a cushion between a fluctuating demand and a continuously uniform production. The interest on capital tied up in material was not always considered, and the possibility of obsolescence was often forgotten entirely. Often excess material was used when there was a choice of saving a dollar's worth of material. Occasionally attention was centered on

normal rate of production.

Common humanity demands that material costs be analyzed and reduced before making reductions in labor which would further aggravate the unemployment situation. At the same time management insists that the investment bring immediate returns. The investment in finished stocks has been reduced greatly or entirely eliminated, making it necessary for the manufacturing unit to respond instantly to fluctuations in demand.

To meet these requirements, the

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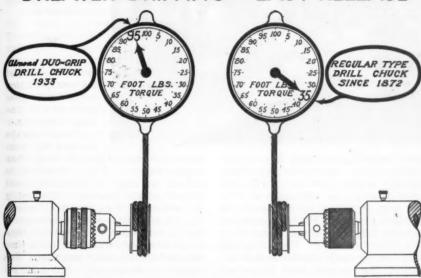
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BY COMPARATIVE TESTS GREATER GRIPPING—EASY RELEASE



THESE ARE THE PRICES YOU SHOULD PAY FOR DRILL CHUCKS: NO HIGHER!

3" Capacity\$3.00	1/2" Capacity\$4.50
1/4" Capacity 3.00	5/8" Capacity 4.50
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3/8" Capacity 3.50	I" Capacity 7.00

THREE TIMES GREATER GRIPPING POWER WITH THE NEW **(Ilmond)** DUO-GRIP DRILL CHUCK

In every instance this new Almond Chuck has proven itself vastly superior to the Best Performance of any previously known Chucks of the same General Type.

J. R. Almond Mfg. Co.,

Ashburnham, Mass.



Instrument and control switch assembly showing production at 3,000 switches per month with 12 operators. (2 operators not present.)

manufacturing unit must have a flexibility which was hardly considered possible a few years ago. The unit must function as efficiently at fifty per cent of normal output as at one hundred per cent. Highly specialized set-ups are not always essential to the utmost economy. The production unit can be made smaller and so arranged that several such units feed to a common delivery point. In this way one unit can produce its quota independently of the others but with maximum efficiency. It cannot be

the transportation problems separated from the other elements.

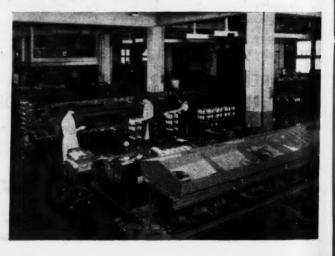
It is not always

must be made and

merely assumed that conveyors will solve all the problems of transportation. A careful analysis It is not always realized that con-

veyors perform a function other than transportation. This function is termed "gaiting" or setting the speed of each of the operations involved in an assembly. This includes "balancing" all operations so that each operation is performed in a period of time which has a uniform ratio to the time required for all other operations. The output of the assembly unit must remain uniform or the efficiency will be seriously reduced. If, as under present conditions, the demand is not sufficient for the full output of the unit,

Assembly of small oil circuit breakers. A more elaborate set up consisting of three duplicate assembly racks. When the production rate is lowest one girl follows the circuit breaker through, performing all three operations performed by the three girls shown.



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it must be operated intermittently or not at all. To justify the investment under these conditions, the return per unit of output must be proportionate-

The illustrations show the assembly of a small but rather complicated instrument and control switch. A careful analysis proved not only that a conveyorized assembly was not economical, but it also showed that transportation as a separate operation could be eliminated entirely.

By arranging the operators on each side of one bench and by a proper division of the operations, each operator could perform his operation and then lay the part down in such a position that the next operator could conveniently pick it up. Thus the various parts would proceed down each side of the bench until ready for final assembly, when they would join at the

This arrangement worked out so that one bench produced what was considered fifty per cent of normal requirements. When the requirements were reduced to twenty-five per cent of normal, each operator was assigned two operations and only one-half of the bench was used, without reducing the over-all efficiency. To increase the production to normal an "L" was added to the bench. This could be continued to twice normal production.

The particular layout described above made possible a reduction in labor cost of sixty per cent. The installation cost was paid for by the savings in less than one month at normal output.

Testing Cast Iron For Nickel

A reliable method for determining the presence of nickel in cast iron or steel is so simple as to be readily applied in any foundry or machine shop. The few materials required may be purchased at a very nominal cost from any chemical house or indeed from a local drug store.

Materials Required

Two small bottles for solutions.
Two medicine droppers.

Filter paper.

Nitric Acid, specific gravity 1.20 (one part concentrated acid and one part water).

Dimethylglyoxime Solution (one gram salt, 66 cc. Acetic Acid 80%, 30 cc. Ammonium Hydrate specific gravity 0.90, 10 grams Ammonium Acetate).

Remove, with file or emery, grease or dirt from small area of piece to be tested. Put one drop of Nitric Acid on this spot and allow it to remain for a few seconds. Place small strip of filter paper over this surface to absorb solution. Put two drops of Dimethylglyoxime on wet area of filter paper.

If material contains nickel filter paper will turn strawberry pink—the higher the nickel content the stronger the color. If there is no nickel present the result will be a red-brown discoloration. Allowing the filter paper to dry for a few minutes brings out colors more clearly.

This test has been found to be sensitive in ferrous alloys containing as low as 0.25% nickel.

(Nickel Cast Iron News)

Rivet Manufacturer Makes Welding Rod

Recognizing the fact that welding as a means of joining metal parts is definitely making scientific progress, The Champion Rivet Company, Cleveland, Ohio, announces a line of welding rods. This company has been making rivets for forty years, and is adding the line of welding rods in order to provide its customers with a complete metal-joining service. Several years of experimenting have preceded the release of the new product.

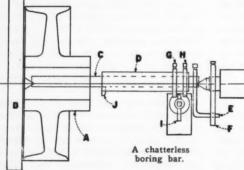
IDEAS FROM READERS

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . We will pay for each one published.

A Chatterless Boring Bar

Bu JOHN E. WAHLSTROM

THE drawing shows the design of a boring bar that was made for boring the hub of a truck wheel of large diameter and long bore. The tool worked very well on this job and



should be useful on other similar jobs.

The cross section of the wheel is shown at A. in the position in which

shown at A, in the position in which it would be as bolted to the lathe faceplate B. Between the lathe centers is a round bar C, of a size that will just slip through a section of heavy seamless steel tubing D. The centers in the bar C are offset and the bar is held in the required position by means of a male dog E, which is clamped to the end of the bar with the tail projecting through the slot in the female dog F. The dog F is clamped over the tailstock spindle. The two dogs G and H prevent the section of tubing D from revolving, and the reversed tool I provides means for feeding the length of tubing along on the shaft.

The tool, J, is set into the end of the tubing and welded in place. The tool can be set out for a new cut as needed by simply revolving the shaft C the required amount and resetting the dog E. A taper can be bored by moving the tailstock over in the same manner as when a taper is to be

turned. An important feature of the bar is that chatter is eliminated, even on long bores.

A Kink for the Hardening Room

By G. A. MURRAY

A FTER a recent rearrangement of our plant, during which the hardening room was moved, it was noticed that complaints from the shop regarding the hardening and

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tempering of tools had increased considerably. As the same steel was being used and the same men were doing the work as were employed before the moving, the reason for the complaints was somewhat of a mystery. Finally, however, someone discovered that all of the complaints were made when the steel had been treated during the afternoon.

Investigation showed that during the afternoon the sun shone brightly into the heat treating department, the west side of the room being practically all glass and thus subjected to the full glare of the sun. The situation was easily remedied by having all the windows on that side of the room painted with green paint. Since that

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time no complaint has been made regarding the hardness or temper of the steel, thus proving that the excess of light made it impossible for the hardeners to gage the temperature of the steel properly by color.

Incidentally, although there are many inexpensive pyrometers on the market, a large part of the tool steel that is used is treated where the temperatures are still judged by the colors. In our shop the naked eye is still depended on for judging temperatures, but new men are examined carefully for their ability to distinguish the changing colors of steel in process of heating. The table showing the relation between color and temperature as used in this shop is as follows:

	Degrees	Color of the steel
F.	C.	
752	400	Red-visible in the dark
885	474	Red-visible in twilight
975	525	Red-visible in daylight
1077	581	Red-visible in sunlight
1292	700	Dull red
1472	800	Turning to cherry
1652	900	Cherry
1832	1000	Bright cherry red
2012	1100	Orange red
2192	1200	Orange yellow
2372	1300	White
2552	1400	Brilliant white
2732	1500	Dazzling white
2912	1600	Bluish white

This table of colors is offered here with the thought that others may find it useful around the toolroom.

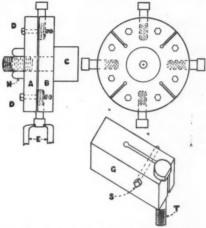
Using the Lathe To Square Bolt Heads

By CHARLES KUGLER

ONE of the jobs that now and then comes up in the small shops is that of squaring bolt heads. If done with the aid of an indexing head on a milling machine, one at a time, this job is an expensive one. By using a lathe and the fixture shown in the drawing, the work can be done much cheaper. In addition, several sizes of

bolts can be accommodated in the fixture.

The fixture consists primarily of two plates A and B, held on a mandrel C. The plate B has, on the contact side, as many grooves as it is planned that bolts shall be machined at a setting. The plate A is slotted with four slots to provide flexibility.



Drawing of fixture used to square bolt heads in the lathe.

Plate A is also drilled to provide clearance for the bolts D, and plate B is drilled and tapped for the same bolts. However, when all the bolts to be machined are of the same size, it is usually only necessary to tighten nut N.

Two tools are used, as shown at E, set to face opposite sides of the bolt head in one operation. When two sides of the bolt heads have been machined, the bolts are turned one-quarter way around and the other two sides are machined. I have seen a fixture like the one described, excepting that it held 18 bolts at a time, machining bolt heads at a speed that was remarkable.

There are times, however, when the fixture described above is not available. At such times I have used the

fixture shown at G. This tool consists of a block of machine steel, slotted and drilled, and held in the chuck of a lathe. The bolt, indicated at T, is held in the block by the tightening screw S. One side of the bolt head is faced and then the bolt is turned one-quarter way around and another side is faced.

Gage for a Radial Surface

By JOHN MCCULLAGH

THE drawing shows the design of a flush-type pin gage for checking the radial surface of a sheet metal stamping that is ½-in. in thickness. Due to the thickness of the metal, the surface produced by the blanking die is somewhat rough; therefore it is necessary to finish the edge by a milling operation in which a hand-oper-

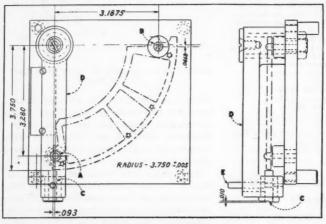
apex of the radius. In use, the workpiece is located on the gage and the gaging arm is swung around so that the flush-pin strikes the face of the work to be inspected. The flush-pin is held against the work by the pin E, which passes through an elongated hole at the end of the swinging arm.

Welding Stresses

By R. H. KASPER

WARPING of a part after a repair by welding is usually attributed to stresses set up by the welding process. In many cases this is true, especially if the part has not been pre-heated and slowly cooled after the weld is completed. However, in many cases the reverse of this is true; in other words, the welding process may

have released the stresses previously existing in the part, the release of these stresses resulting in warpage and misalignment. In many cases the stresses existing in the part may have been the cause of the original breakage. A case in point verifies this fact. An experienced weldafter twice welding a cracked casting which in



Gage for Inspecting a Radial Surface.

ated fixture is used. The radius is finished to 3% in. and is held to a tolerance of plus or minus 0.005 inch.

The workpiece is located on the gage by two plugs and locating bushings as shown at A and B. The flushpin gage C is mounted on the swinging arm D, which is pivoted at the

both cases cracked again upon cooling, cut the casting completely thru and then welded the two parts together. Thereafter no cracks appeared, indicating that stresses had existed which were not removed by the heating, but which were released when the casting was cut completely through.

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THE ULTIMATE in Gear Finishing

FELLOWS GEAR LAPPING MACHINE

(3-LAP RECESS TYPE)

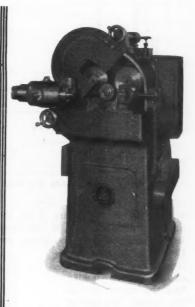
PERFECTED after several years of extensive experiment and actual production application, the FELLOWS METHOD of finishing gears by lapping after hardening at last provides the final measure of COMPLETE CONTROL over GEAR ACCURACY and QUIET OPERATION. This economical method of finishing gears after hardening is of vital importance to the GEAR INDUSTRY, providing as it does:

CONTROLLED ACCURACY AFTER HARDENING
QUIETER OPERATION
INCREASED LIFE
NO MORE TEAR DOWNS
LOWER COSTS

For more complete information, write:

THE FELLOWS GEAR SHAPER COMPANY

78 River Street, Springfield, Vermont (616 Fisher Bldg., Detroit, Michigan)



3-LAP GEAR LAPPING MACHINE

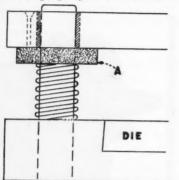
The three laps are driven by the work, their free rotation being restrained by independent adjustable brakes, and finish the entire tooth profile of the hardened gear to precision limits . . . and at a cost unapproached by any other method.

FELLOW/ GEAR SHAPERS -

Oiler for Guide Pins

By E. ERLING

THE drawing illustrates a simple method of keeping guide pins on die sets properly and automatically



Felt Washer Keeps Guide Pin Oiled.

oiled and free from dirt. A felt washer % in. thick by 2 in. in diameter indicated at A in the illustration is slipped over the guide pin so

that it is located between the under side of the punch holder and the upper end of the spring, the spring holding it in position. An oil hole is drilled through the punch holder at point where oil, injected through the hole, will be absorbed by the washer. As the punch moves up and down on the guide pins, the washer moves with it. keeping the pin constantly wet with a film of oil. After the washer has become

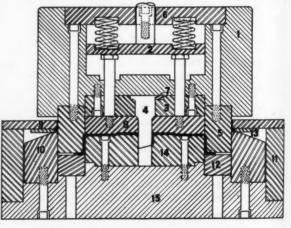
soaked with oil it requires practically no attention excepting that the oil hole will need to be filled once a day.

A Good Blanking, Forming, Shearing, and Bending Die

By ARTHUR MUMPER

THE cross section drawing shows the design of a die that was made to blank, form, shear, and bend a lug on a brake drum. This part was originally formed by punching out flat discs and welding the bands to them, the part having neither hump nor flange. After the band had been electrically-welded to the disc, a square hole was punched in the center of the disc and a section of angle iron welded in place in one side of the hole to form the lug. This method was used until about a year ago.

It was finally decided that a stiffening flange was necessary, which made the operation of welding the flange to the band so expensive that the manufacturer decided to have a die made and produce the piece in a press. The



Blanking, Forming, Shearing and Bending Die.

piece is produced complete at one stroke of the press by the use of the die shown. Diemakers will find the

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Detail No. 1	Donah Diagh	C4 Y	
Op. No. 1	Punch Block		Hrs
1—Set up in lathe an 2—Face top, finish in 3—Set up and finish 4—Drill, tap, and cou- that detail. Same	nside. Two spots of opposite end interbore. Screw less procedure for De	on O. D. for indicating	3.0
			9.2
Detail No. 2	Upper Knockou	t Pad Mach. Steel	
Op. No.			Hrs
1—Cut out from plate	e stock with acety	lene torch	
		• • • • • • • • • • • • • • • • • • • •	
			2.2
Detail No. 3	Punch Holder	Mach. Steel	2.2
Op. No.			Hr
-Blanchard Surface	Grind both sides		
Turn O. D., bore	and counterbore		
Inspection			
			3.7
Detail No. 4	Punch Tool	Steel	0.0
On No			Hrs
Turn complete on	centers		
2-Set up and mill er	nd 1" square. Mill	l flat on opp. end	
-Harden			
Grind body diamet	er		
-inspection			
			5.2
Detail No. 5	Forming Punch	Ring Tool Steel	0.2
On No			Hrs
-Set up, face and b	ore, turn O. D		2.7
2—Set up, finish opp	posite end		
3—Drill and tap six	%" holes		
-Blanchard surface	grind top and bo	ttom	
Grind O. D. and I	. D		
Inspection			
			9.2

design of the die interesting, and the time for the manufacturing operations on the die as outlined on the instruction sheet will show the extent to which this plant goes in providing instructions to its mechanics. Only a part of the instructions for the building of this die are given.

Universal Centering and Drilling Jig By J. C. HART

THE photographs illustrate a universal drill jig that is useful on many kinds of work and is particular-

ly advantageous for use on porous cast iron or other work where, unless it were confined by means of a bushing, the drill would tend to run out The jig consists of a steel block with a hardened steel bushing liner pressed into a hole in one end, a portion of the block being relieved under the end containing the liner to provide clearance for chips. A set of hardened steel drill bushings in a complete range of standard sizes is provided, all the bushings being ground to a sliding fit in the liner in the jigblock. Included in the equipment is a male center, also ground to a sliding

(Continued on page 26)

They were up against the Problem of Cutting 18" and 22" Necks from Cromonite Chilled Rolls



ERE again Carborundum service and products solved a vexing problem—this time for the Hubbard Steel Foundry Division of the Continental Roll & Steel Foundry Co. at East Chicago, Indiana. One of the products of this prominent Company is "Cromonite" chilled rolls—scleroscope up to 90 maximum.

They had found no practical method or tool that would cut off the risers and necks weighing from two and a half to three tons. They had spent thirty-four hours with a tool and penetrated no more than a half inch.

THE CARBORUNDUM COMPANY

CANADIAN CARBORUNDUM CO., LTD.,

SALES OFFICES AND WAREHOUSES IN New York, Chicago, Boston, Philadelphia,
The Carborundum Co., Ltd., Manchester, England

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-but it Didn't Take Long to Do the Job with

Carborundum Brand Redmanol Cut-off Wheels

A CARBORUNDUM service man was called in. He looked the job over, recommended the use of Carborundum Brand Redmanol Cut-off Wheels and

estimated the cut could be made in three hours.

A 30 x 1 x 14-inch wheel was mounted on a Farrel Roll Grinder and a four inch cut was made. Then to prevent binding a three-quarter-inch thick wheel in the same diameter was used to complete the cut.

The first 18-inch roll neck was cut in two and one half hours. Later this time was reduced on other rolls to one hour and forty-five minutes. The 22-inch necks are cut in two hours and ten minutes.

The problem has been solved—just as has many another grinding problem—with Carborundum engineering service and Carborundum Brand Products.

VISIT THE CARBORUNDUM EXHIBIT AT THE NATIONAL METAL EXPOSITION AT BUFFALO, N. Y.



NIAGARA FALLS, NEW YORK

NIAGARA FALLS, ONTARIO

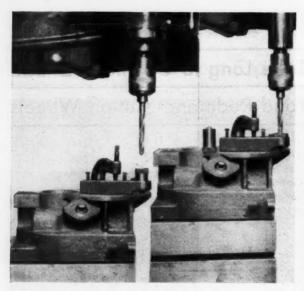
Careland, Detroit, Cincinnati, Pittsburgh, Milwaukee, Grand Rapids, Toronto, Ont. Deutsche Carborundum Werke, Reisholz bei Dusseldorf, Germany

OF THE CARBORUNDUM COMPANY)

TD.,

elphia,

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Left—Locating universal jig-block by means of center inserted through bushing liner. Right—Jig-block with bushing in place for drilling.

Ideas From Readers

(Continued from page 23)

fit in the liner and with a knurled section at the top to aid in handling.

The jig is intended for use on work that has been laid out. After the location of the hole to be drilled has been prick-punched, the jig is clamped lightly in position and the center is used to locate the jig exactly central with the punch mark. The jig is then clamped, the center is removed, and the bushing to be used is slipped into the liner in the jig.

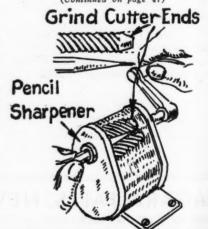
In our shop we have three of these jig-blocks of different sizes, enabling us to use bushings up to 2 in, in diameter. The middle-size jig rests on three legs which consist of screws threaded through the block so that the block can be properly leveled when it is to be used on a rough casting.

Pencil Sharpener For Draftsmen's Pencils

By MORRIS A. HALL

RACTICAL. LY every drafting room is equipped with a mechanical pencil sharpener, despite the fact that the usual sharpener does not produce the kind of point that most draftsmen prefer. It is not a difficult matter, however. to change the shape of the cutters so that the preferred type of long lead can be obtained. Remove the cutters and grind off the edges toward the handle end until about %-in. has been made smooth, as

shown in the drawing. When reassembled, the tool will produce a point that will project some %-in. beyond (Continued on page 47)



Pencil sharpener ground to produce a long lead on a drafting pencil.

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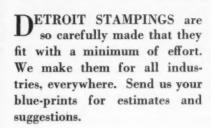
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Stampings that fit!

This peculiarly twisted steel reinforcement bracket replaces two ordinary stampings. It is an interesting example of the kind of stampings used by automobile manufacturers to achieve the modern lines of body design.



DETROIT STAMPING CO.

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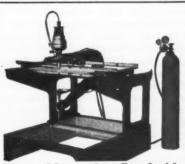
The "CHAMPION" EXPANDING MANDREL

is the only Mandrel which completely and accurately fills the hole.

One set of "Champion" Expanding Mandrels—twelve of them—will fill by thousandths any inside diameter from $\frac{1}{2}$ " to $\frac{61}{2}$ ".

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New .. Versatile .. Profitable

THE New VULCAN Flame Cutter provides large savings by rapidly and economically cutting almost any kind of steel. Uses CITY GAS and oxygen. Working surface is 24" x 36" and work from 4" to 8" in thickness can be cut. It substitutes for many shop tools and there is no limit to the variety of patterns that can be cut. Easy to operate. Write for complete details. No obligation.

VULCAN ENGINEERING CORP.
JACKSON MICHIGAN

Over the Editor's Desk

How Is Your Illumination?

SURVEY made by the lighting engineers of the Westinghouse Company shows that more than 80 out of every 100 industrial plants are inadequately lighted. These 80 include plants in which the illumination is just short of being "good enough," down to plants in which the lighting system consists of a drop light hung over each machine. In the latter cases the aisles are dark; in fact, everything is dark excepting the particular spot upon which the light is directed. Yet a workman is rarely known to complain of poor light, and if his work is spoiled, or badly done he is usually blamed instead of the lighting system.

Undoubtedly most plant executives feel that their particular plant is one of the two out of ten that is wellenough lighted. It is this feeling of satisfaction that is responsible for the inadequate illumination in the other eight plants. Many plant managers take the attitude that electric lamps and the current to operate them constitute so much expense, and that the addition of more or better lamps is simply adding to the expense, without considering the fact that good lights are as necessary as good tools, and that it is as difficult to turn out good work under poor lighting as with poor equipment.

The expense of operating a lighting system consists mostly in the current consumption, and the difference between the cost of operating poor or good equipment is small compared to the saving on the quality and quantity of the work produced. A bearing manufacturer increased the illumination in his inspection room from 5 to 20 foot-candles, and his production jumped from 408 to 458 pieces per

operator per hour-equal to 12.5 per cent. Another manufacturer increased his production over 25 per cent by increasing the illumination in his plant to a point of sufficiency. another plant the accident claims paid per year amounted to around \$15,000. By spending \$2,800 more per vear for electric light the accident claims were reduced to a total of \$8,800, with a saving of \$6,200.

A request to your power and light company will, in most cases, bring a lighting engineer with a foot-candle meter by which he can accurately measure the light delivered to any point. From 15 to 18 foot-candles delivered at the work is usually adequate.

It Is Being Done

WE have just been reading an interesting report from a firm that refused to be submerged under Instead of diseconomic pressure. charging all the workmen that could be spared and "digging in" to await the return of prosperity, the president of this firm decided that they should go out and determine for themselves where business was hiding. The territory was divided and investigators were sent out to unearth every possible prospect, with no reference to the limits set by the previous prospect lists.

The immediate results have been that several sales offices have been opened and the sales personnel has been increased by more than fifty per cent. The survey has paid for itself in new business, the prospect list has been augmented by a large number of names of good, wide-awake firms, and a vast quantity of potential business has been uncovered.

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GUSHER GOLANT

The Biggest and Best



manufacturers equip their machine tools with GUSHER COOL-ANT PUMPS because of their great durability and troublefree performance in supplying instant coolant.

MODEL

They are consistent in volume and protection.

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A Hardness Tester

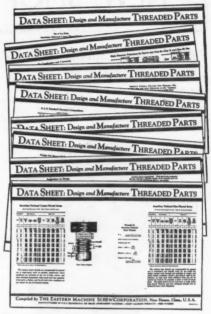


Never guess about things you can measure. The Duroskop measures the hardness of most metals with but little preliminary fuss. Readings can be made in two seconds.

Ask for bulletin No. H-4

THE R. Y. FERNER CO.
Investment Bldg. Washington, D. C.

DATA SHEETS ON THREADED PARTS



No. 1—Important suggestions for designs that reduce cost.

No. 2—Coarse and fine pitch series with complete basic data.

No. 3—Tap drill sizes recommended for coarse and fine thread series.

No. 4—Classification of fits with tolerances for Classes 2 and 3.

No. 5—Data on pipe threads, taper and straight, and threads for brass tubing.

No. 6—Tables showing S.A.E. standard chemical compositions of steels for various uses.

No. 7—Charts on cutting speeds and net production per hour.

No. 8-Weights per foot of different stocks.

These data sheets are only valuable to you if you are engaged in the designing or manufacturing of threaded parts. Write us on your firm letterhead and we will gladly put your name on our mailing list. In writing, please let us know if you use self-opening die heads.

EASTERN MACHINE SCREW CORPORATION 140-150 Truman St., NEW HAVEN, CONN.

Manufacturers of World-famous H & G Self-Opening Die Heads.

NEW SHOP EQUIPMENT

Fellows Gear Lapping Machine

The Fellows Gear Shaper Company, 78 River Street, Springfield, Vermont, has developed a new method of finishing external spur, helical, and herringbone gears by lapping after hardening. This process, in addition to smoothing the contacting profiles of the teeth, also

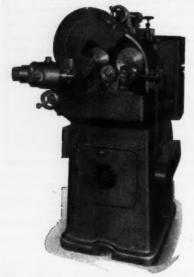


Fig. 1—Front view of Fellaws 3-lap Type Gear Lapping Machine adapted to External Spur, Helical and Herringbone Gears.

removes slight distortions resulting from heat treatment, thus producing more accurate, efficient, longer lived, and quieter operating gears.

The economy of the process lies in the fact that in the majority of cases the gears can be lapped in a few minutes. Furthermore, as the machine is automatic in operation, each gear is lapped for a definite period so that consistent results are not dependent on the skill of the operator. The outstanding features of the machine are: rapidity

of lapping, correction of tooth shape and helix angle of helical gears, and the production of smoothly finished tooth profiles on a high production basis.

The principle of operation of the maas shown in Fig. 1, which is known as the "3-Lap Recess Type," differs entirely from that of rotating gears with lapping compound introduced between the teeth. Its success does not depend simply upon the rotation of the work and laps to effect the lapping action. It affords, in addition, a recipro-cating movement of the work at a fairly high rate of speed, effecting an adequate distribution of the lapping compound over the contacting teeth. spindle which carries the work is positively driven through change gears, and the three laps are rotated by the action of the work. Independent and adjustable friction brakes, as shown in Fig. 2, are applied to each of the three lap spindles so that the pressure of the laps on the work can be varied to suit conditions.

Since the work affords the only positive drive for the laps, and since the free rotation of the laps is restrained by friction brakes, it is evident that the contacting pressure of the laps will be equally distributed, thereby equalizing the lapping action. The drive for this reciprocating motion and the drive for the rotary motion of the work are independent of each other, so that the rotative speed and number of strokes can be varied to suit the number of teeth in the gear being lapped. The length of the stroke can also be varied.

In order to change the pitch line contact of the three laps on the work, each of the laps can be made with a different number of teeth. The center distances of the work-spindle and the three lap spindles are not adjustable, but through the medium of an independent mechanism the two upper lap spindles, which are mounted on self-aligning ball bearings, can be set at a slight angle with relation to the axis of the work, see Fig. 3. This feature makes possible the correction of slight errors in the axial relationship of the

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teeth, which results from distortions in heat treatment, and will be found especially advantageous in lapping helical gears. The limit switch, shown to the right in Fig. 2, can be set to any one of eight predetermined number of revolutions of the work in both directions, upon the completion of which the machine stops automatically.

It will be seen from the foregoing that provision is made for controlling

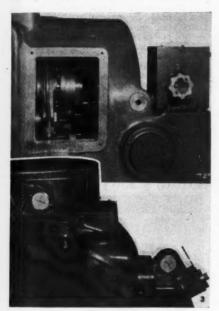


Fig. 2—Close view of machine showing Independent and Adjustable Brakes on Lap Spindles, and Limit Switch for automatically controlling number of revolutions of work in both directions. Fig. 3—Close view of machine showing one-ten-thousandth Dial Indicators applied to two upper Lap Spindles for use in setting machine for correcting distorted helical teeth.

automatically the number of revolutions of the work in both directions; for changing the reciprocating stroke of the work, depending on the design and requirements of the latter; for changing the relative rotative and reciprocative speeds; for adjusting the necessary braking action to promote efficient lapping action; and finally a means for accurately changing the axial relationship of the two upper lap spindles to the

work, so that errors in lead of helical gears can be corrected.

The amount of offset or misalignment of these two upper spindles is definitely indicated by means of dial indicators reading to one-ten-thousandth of an inch, so that the operator has the means at hand, once he knows the error in lead of the gear, to accurately set the machine to accomplish the desired connection.

The material customarily used for making laps for use on this machine is a good grade of cast iron. The best results are obtained by using a compound of 320 to 400 grit with an oil which will keep this compound in suspension.

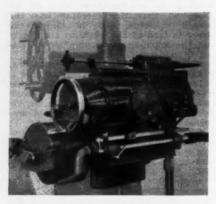
The finish on the work and the time required for lapping is controlled by three factors: 1. Amount of lapping necessary to remove inaccuracies. 2. Lapping compound used. 3. The rotative and reciprocating speeds employed. For the average gear it is best to employ a comparatively slow rotative speed and a high reciprocative speed with a comparatively short stroke. For a 26-tooth gear of 34 inch face, the reciprocating stroke should not exceed 1/4 inch (this, of course, being governed somewhat by the design of the gear), about 400 strokes per minute, and a rotative speed of 200 surface feet per minute at the pitch The average lapping time varies from 1 to 4 minutes, depending on the conditions previously stated.

This machine is designed for individual motor drive. A 2 H. P. motor, 1,200 r. p. m., mounted in the base drives the machine through a single pulley and operates both the rotative and reciprocating mechanism; also the lubricating pump and electric limit switch. A ½ h. p., 1.800 r. p. m. motor, mounted in the opposite side of the base, drives the compound pump.

Automatic Cross Feed Now Available on Norton 10" x 12" Surface Grinding Machines

A hydraulically-operated automatic cross feed or wheel traversing mechanism which eliminates the undesirable features formerly associated with such devices, is now offered by Norton Company, of Worcester, Massachusetts, for use with its 10 x 12 in. surface grinding machines. Maximum efficiency from

the grinding wheel is obtained since the wheel can be fed across the work at each reversal by increments that utilize the full width of the standard 1½ in wheel. In the past the greatest feed



Automatic Cross Feed on Norton 10 x 12-In. Surface Grinding Machine.

possible was only a small fraction of the total wheel width. The elimination of manual cross feeding gives the operator time for gauging work or running another machine.

The mechanism is adjustable and provides any feed from 1/16 in. up to 1½ in. and the direction of the wheel traverse is automatically reversed by the use of dogs which can be set to accommodate any width of work up to 10 in.,

the capacity of the machine.

Oil is drawn from the same reservoir and by the same pump that supplies the table traverse mechanism, and an adjustable metering device in the apron controls the amount of feed. From the metering device the oil is delivered through a telescoping pipe to a traverse reverse valve mounted on the vertical slide. From the traverse reverse valve the oil is conducted through ports to a cylinder on the underside of the vertical slide. In the cylinder is a double rodded piston (for equalizing the displacement) connected to the wheel

Wheel truing is accomplished by manual operation of the traverse valve and the same control is used for disengaging the power cross feed to permit hand feed. The hand feed wheel, when used, is held in against a spring and is automatically disconnected when the power cross feed is being used.

Madison-Kipp Small Die Casting Machine

A small die casting machine, to be known as the "Kipp-Caster No. 11—The Mechanical Foundry," has been developed by The Madison-Kipp Corporation, 217 Waubesa Street, Madison, Wis. The interesting features of the machine are its size, ability to handle all common die casting alloys including Magnesium, quick die changing arrangement, and convertibility into a permanent mold machine for casting brass. No previous training in die casting work is necessary to the successful operation of this machine.

The mechanism is built into a onepiece body consisting of a semi-steel casting a yard long, attached to a leg casting that is bench high. Other essential parts are the base, ram, body, main pinion operated by a spoked wheel, metal well, metal forcing plunger, plunger operating lever, and die locking plunger. The stationary half of the die is mounted on the head platen, and the movable half is mounted on the ram die head. The movable half



Kipp-Caster No. 11—"The Mechanical Foundry."

ELECTROBLAST

High Speed . . . Muffle Furnace

It fits present conditions alike a glove » Initial cost low and operating expense only a fraction of your present figure. Needs no blower, compressor or piping.



Heats to high speed Temperatures in 15-25 minutes. Costs 7c per hour to operate. Compare it with your present equipment.

Muffle Dimensions 31/8" wide, 21/4" high and 61/3" deep. Bench space required 15 x 20".

> Stark Tool Company, Waltham, Mass.

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Originators of the American Bench Lathe



The Demagnetizer For Alternating Current

THE J & H Demagnetizer requires no counter-shafts, belts, or other intricate electrical connections. All that is necessary is to plug it into the nearest lamp socket or receptacle.

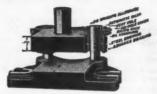
It is of the new Unipole type-heavy duty-and can be supplied for either 110 or 220 volt alternating current. Size 12" long, 9" deep, 6" high. Weight 60 lbs.

Sold On One Week's Trial!

J. & H. ELECTRIC CO. 202 Richmond Street, Providence, R. I.

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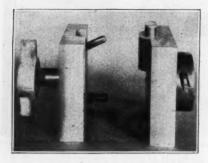
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is carried to the stationary half when the spoked wheel is rotated to the left, this movement also positioning the metal well under the dies. When the dies are closed, the metal well is auto-



Cam-Lock Dies used in "The Mechanical Foundry."

matically raised to casting position, and when the dies are open, the well is automatically lowered to pouring position. A lock prevents the dies from opening while pressure is being applied to the metal.

The metal plunger operates in the sleeved metal well by means of a lever which is latched until ready to apply pressure to the metal, when the lever may be unlatched and allowed to fall,

or it may be pumped.

In operation, the molten metal is poured into the metal well by ladle and the dies are closed by means of the spoked wheel. The metal plunger is then unlatched or pumped. The metal plunger lever is then raised, the dielocking plunger is raised, and the dies are opened by means of the spoked wheel. Castings are automatically ejected from the die by means of knockout pins in an ejector plate that moves forward as the dies are opened. The complete cycle takes 15 seconds. Production speed, however, depends upon the speed of the operator.

The dies used in this machine are identified as Kipp Cam Lock Dies, and are made of cast iron, alloy iron, or die steel, depending on the kind of metal to be cast and the length of the run. They are built to definite standards for interchangeability. Core-pulling is accomplished automatically with the opening and closing of the dies. An angle guide pin may be used for a core pull, or a lever and roller traveling in a cam

track may be utilized. To prevent metal chilling in the metal well between the time of loading and casting, a small gas nozzle is introduced through the head plate so that a blue gas flame can be used to keep the metal well casting up to the proper temperature.

The machine may be converted from a pressure die casting machine to a permanent mold machine for gravity casting brass by turning an adjustment screw which locks the metal well in its lowered position. The metal plunger and handle remain inoperative, but the die is closed and opened as for pressure casting, and core pulls and casting ejection are automatic. For permanent mold casting, the gate is on the top.

No. 0 Grand Rapids Motor-Driven Surface Grinder

A surface grinding machine especially intended for very fine, delicate, and accurate work has been placed on the market by Gallmeyer & Livingston Co., 334 Straight Street, S.W., Grand Rapids, Michigan. The machine is available mounted on a column, as illustrated, or it can be furnished in bench type. A



No. 0 Grand Rapids Motor-Driven Surface Grinder.

portable type of column can be furnished where it is desired to move the machine about the shop.

The column is a heavy, rigid casting, upon which the motor and the bronze

nut for the vertical screw are carried This casting provides the dovetailed ways for raising and lowering the knee. The knee is mounted on the main column by means of the vertical dovetailed ways with convenient provision for compensating for wear. The knee is raised and lowered on the vertical ways by means of the large hand wheel, which engages the elevating screw through accurately cut beveled gears and rotates the screw in a stationary

bronze nut. The hand wheel is graduated in thousandths of an inch with an adjustable pointer. The ways on the top of the knee are 7½ in. apart, of generous area, and are of the dovetailed type with ad-

justable gib.

The saddle is supported on the top of the knee with dovetailed ways and bearings the full length of the knee. The upper surface, which provides the bearing for the longitudinal table movement, is 16 in, long. The table is 5 x 29 in. over all, with a 5 x 12-in. working surface. T-slots are provided and arranged for carrying a magnetic chuck. The longitudinal table travel of 12 in. is provided by a rack and spiral pinion, actuated by the hand wheel. The 51/2-in. cross feed is provided by an Acmethread screw on which a hand wheel is mounted. The screw works in a stationary bronze nut. The cross feed dial is graduated in thousandths of an inch.

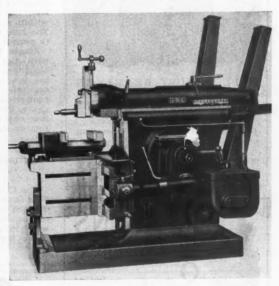
The 6 x ½-in. grinding wheel, which is standard equipment, is carried direct on the shaft of the special motor. The motor is mounted on the column, and the spindle runs in specially-selected ball bearings. A ½-h. p. motor is standard equipment and can be furnished for either A. C. or D. C. current.

Gould & Eberhardt Industrial Shaper

Gould & Eberhardt, Irvington, N. J., has brought out a line of crank shapers, designated as "Industrial" Shapers, in twenty-two different models and in sizes from 16 to 32 in. inclusive. The shapers are designed for easy operation and for

maximum efficiency. Among the outstanding features are the rapid power traverse and the automatic crossfeed to the table.

The rapid power traverse to the work table is built in, and operates in the opposite direction to the feed set. The table is traversed in either direction at a speed of 100 in. per min. A self-releasing control automatically relastates the feed, and a safety device provides against damage. The automatic cross-



Gould & Eberhardt Industrial Shaper

feed to the table is operated by a single cam, synchronized with the return stroke of the cam. Sixteen changes of feed are available from 0.012 in. to 0.200 in. A direct-reading feed dial indicates feed changes. The direction of feed is controlled at the rail.

The tool head is arranged with a new type of head lock, operated with a single control. The vise is of improved design, with the jaws projecting over one side of the table to permit end shaping. Either single or double screw vise is optional.

Lubrication is provided by a circulatory pressure system which is in operation continuously, feeding to the ram guide ways and the entire linkage system, including the sliding block and pin. A filter keeps the oil clean. The double

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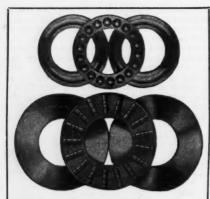
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It is good business to use good gears — PERKINS Gears—gears that provide highest economy in your manufacturing program.

SEND YOUR BLUEPRINTS FOR ESTIMATES.

Perkins Machine & Gear Co. 151 Circuit Avenue SPRINGFIELD, MASS. crank gear transmission, which is an exclusive feature with this company, has been retained. The two crank gear terminus provides a wide range of strokes, without excessive gear speed. Fewer gears, less wear, and more power are advantages of this transmission. All gears are of the helical type.

The front end of the table is guided and supported by a non-slip table support which can be locked without disturbing the alignment of the table. The crossrail is clamped to the very wide front of the frame, and is adjustable within a narrow vertical vee guideway. The hole in the frame has been retained to permit the keyseating of long shafts.

Single belt pulley drive is standard, with the pulley mounted on Timken bearings. The starting clutch and brake are governed by a single control. The machine may be arranged for direct-connected motor drive, by a pair of gears, multiple vee belts, or chain. The low operating height is an important feature of the design.

"Cimatool" Diamond Boring
Machines

The City Machine & Tool Works, 1521 East Third Street, Dayton, Ohio, has developed a line of diamond boring machines, made in three types to meet a wide range of applications. The machine illustrated in Fig. 1 is a bench



Fig. 1—"Cimatool" Bench Type Diamond Boring Machine

type machine adapted for such boring operations as the bronze or babbit bushings in end frames of small electrical motors, wrist pin bearings in small refrigerator pistons, small bushings, and

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other similar operations. Holes up to in in diameter can be bored on this machine.

The machine is semi-automatic in that the operator places a piece of work in position and starts the machine, after which the cycle is automatic, the machine stopping after the bore has been completed. This is a production machine and is specially tooled for the particular job on which it is to be used. The illustration shows a machine equipped for boring the bronze bushing in a motor end frame. In this case the machine is equipped with a magnetic chuck and the operation is as follows:

The work is locked in position on the chuck and one of the two electric switches is pulled forward to energize the chuck and hold the work in place. The operator then pushes the exhaust tube against the end of the work, so that borings may be carried away by a special exhaust system. Next, the operator closes the second electric switch, thereby starting the machine on its cycle of automatically controlled operations. Attention is called to the fact that current for the driving motor is by-passed through the magnetic chuck in such a way that the starting switch



Fig. 2—"Cimatool" Diamond or Carbide Boring Machine

is inoperative unless the chuck is energized and holding the work securely in place.

With both switches closed, the spindle starts rotating and feeding the boring tool through the hole to be finished. The spindle is fed forward against the tension of a spring, and after the bore

FACTS—for men who cut metal



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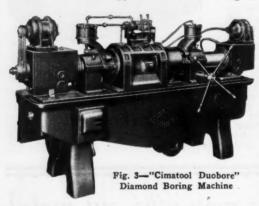
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has been completed, an automatic trip opens the switches, thereby cutting off current from the driving motor. Simultaneously an electrically-operated friction brake stops rotation of the spindle, and the clutch controlling the spindle feed is also released so that the spring may withdraw the spindle to the starting position.

The machine illustrated in Fig. 2 is adapted for boring holes up to approximately 6 in. in diameter. It is built in both single and double end types and with one or more spindles according to requirements of various production jobs. This machine finds application for the



boring of the larger sizes of pistons, connecting rods, electric motor frames, and so on.

It will be apparent from the illustration that the principle used in the pre-ceding type of machine is reversed, in that the revolving spindle remains stationary while the work, carried on a reciprocating table, is fed to the spindle. But like the preceding machine the operation is semi-automatic in that the operator loads the work-holding fixture and pushes the starting button, after which the cycle is automatic to its com-Provision is made for quick traverse of the work to the boring tool, and in the case of interrupted bores for the quick traversing of the work across such gaps in the bore. After the operation has been completed the work-carrying table returns to the starting point.

It will be borne in mind that the operator has started the machine by pushing an electric button. This starts rotation of the spindle and also makes operative the hydraulic feed. At completion of the bore in the work a second stop carried by the table pushes the electric

stop button. This cuts off electric power and at the same time permits an electric brake to instantly stop the motor and rotation of the spindle. The hydraulic feed still remains operative for the quick return of the table and work to the starting position. The table is carried by one Vee bearing and one flat bearing, the bearings being completely enclosed to afford protection from borings, and thoroughly lubricated from oil reservoirs.

The machine illustrated in Fig. 3 is known as the "Duobore" because it has been designed for the simultaneous boring of work from opposite ends. This

machine has been specially built for the boring of all kinds of transmission gears used in passenger cars and trucks, but it is equally efficient for single bearing gears and for double end bearings as applied in cluster gears. Where used for double end bearings the opposed spindles bore the piece from opposite ends simultaneously. When used on single bearing gears two pieces of work are bored in the same manner.

The machine is equipped with Bolender gear chucks, carried in a substantial housing in which they are accurately located in alignment with each other. On this machine the boring spindles feed forward through the

chucks, and particular attention is called to the fact that the boring spindles are carried by housings in which each spinsupported by precision ball is bearings. The spindles are made short preserve accurate alignment and freedom from whip, and are connected to their respective driving shafts by universal couplings, thereby maintain-It will be ing accurate alignment. seen that each spindle is driven by an electric motor, a third motor under the machine actuating cams which feel the spindles to the work and withdraw them after the boring operation has been completed.

To bore a cluster gear with double end bearings, the operator slips the gear into the Bolender gear chuck to the left. With the capstan wheel he then advances the right hand chuck to engage the opposite end of the gear, after which he pulls down the right hand of the two valve levers seen above the chuck housing. This opens a valve, permitting the two hydraulic cylinders to apply pressure for simultaneously closing the two chucks. When the control lever is

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two is thrown down it exposes the electric starting button, allowing the operator to push this button to start rotation of the spindles and feeding of the spindles into the work.

After boring has been completed, an electric trip automatically stops the two spindle driving motors and applies electric brakes to instantly stop these spindles. The motor that actuates the feed cams withdraws the spindles from the work and automatically stops. The operator then pushes up the right hand hydraulic control lever, releasing the right hand gear chuck only. Turning of the capstan wheel then returns chuck to the starting position. If both gear chucks were released simultaneously, the withdrawal of the right hand chuck from the work would tend to pull the work out of the left hand chuck. To remove the work it is merely necessary for the operator to take hold of the piece with his left hand and throw the left hand hydraulic control lever up, thereby releasing the pressure so that the piece can be removed from the chuck.

Where this machine is used for boring single bearing gears the right hand gear chuck remains permanently in its "return" position. One gear is located into each chuck and the chucks closed ready for boring the bearings. Otherwise the operation is identical with that described for double bearing gears.

Aristo No. 21 Production Timer

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York, N. Y., will eliminate cumbersome tabulations and lengthy computations. Errors are thus precluded and the information required is available immediately.

The large dial is graduated in hundredths of a minute and numbered in tenths, and the small dial is graduated for thirty minutes, with numbers in multiples of three. In addition to the net working time in decimals of the minute, the production per hour is given for operations requiring less than a minute. For example, if an operation is started as the hand leaves zero and is finished by the time the hand has reached the figure 230, the reading would show that 230 operations could be performed per hour, based on the time consumed by the one operation.

The watch is also equipped with the Time-Take-Out feature, which serves an essential purpose. In case an interruption occurs during the major operation, the hand may be stopped and restarted without being returned to the zero point. This is accomplished by pushing the slide lever on the side of the case, instead of depressing the crown. Depressing the crown returns the hand to zero.

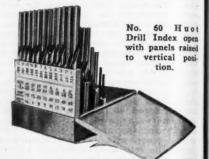
FILE YOUR DRILLS

Huot Drill Index
The most usable and efficient drill filing system obtainable.

Circular
HUOT MFG. CO., 128 E. 10th, St. Paul, Minn.

Huot Drill Index

The Huot Manufacturing Co., 128 East Tenth Street, St. Paul, Minn., is now marketing the drill stand and index shown in the illustration. The index consists of a small metal cabinet containing several panels, each of which is hinged so that, when in use, the cabi-



net serves as a base in which the panels are raised to the vertical position, as shown in the illustration. When not in use, the panels fold into the cabinet and the door closes, holding the drills in place. When closed, the panels locate so that the end of the box holds the drills in place and prevents them from falling out even when partly used.

The cabinet is made of cadmium-plated steel. The No. 60 Index, which is shown, is 3½ in. wide, 4½ in. long, and 1 in. deep. It holds and is indexed for 60 drills of wire gage sizes from 1 to 60 inclusive. Under each drill hole, in addition to the size, is stamped the decimal equivalent of the number size. The outer panel also carries information as to body drills and tap drills for taps down to No. 2—56 thd.

Huot drill indexes are made in vari-

WEL-DON DOUBLE-END MILLS

DOUBLE-END feature gives longer life at less cost — PLUS, of course, the well-known Wel-Don advantages of highest speeds and fastest feeds.

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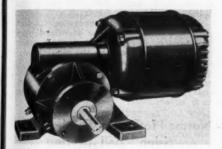
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ous sizes according to the sizes of the drills to be used. The No. 13 Index provides for the range from 1/16 to ½ in. inclusive by 64ths, and the No. 29 provides for the range from 1/16 to ½ in. inclusive by 64ths.

Janette Type SW-2 Motorized Speed Reducer

The Janette Manufacturing Company, 556 West Monroe Street, Chicago, Ill., announces the addition of a new unit—the Type SW-2—to this company's line of motorized speed reducers. The Type SW-2 consists of a ball bearing Janette motor built integral with a worm-gear reduction unit in such a way that the end frame of the motor is actually a part of the gear housing and the worm is keyed to the motor shaft extension.



Janette Type SW-2 Motorized Speed Reducer

The slow-speed shaft is fitted with tapered roller bearings.

Twelve ratios, from 90:1 to 8:1, have been adopted as standard, although intermediate ratios and ratios up to 120:1 are available. Motors of 1/6 h.p. to 1 h.p. can be supplied. Standard motor speeds are 1,725 and 1,140 r.p.m.



Mummert-Dixon Facing Heads

8 Sizes-6" to 40"

We can't say much here . . . but if you write for a bulletin we'll show you how this tool will save you money.

MUMMERT - DIXON CO. 120 Philadelphia Street Hanover, Pa. The unit shown in the illustration is fitted with a "foot-and-single-flange" mounting with the flange on the right hand side. It may also have a flange on the left or both sides. Or it may be had with no flange; simply with footmounting. Flange-type units are furnished either with or without the mounting feet.

Falk Motoreducer

The Falk Corporation, Milwaukee, Wisconsin, announces three styles of the "Motoreducer"—a combined motor and



Falk Motoreducer

speed reducer—which are said to represent a distinct departure from previous design practice. The three types are



TAKE it to the job—or use it at the bench—anywhere. Grinds things that can't be touched with a file.

Turns at 10,000 R.P.M. on 110 v. 60 cy. Operates on A.C. or D.C. Push button control. Free trial. Three wheels sent free. Money refunded if not satisfactory in five days.

M. C. TOOL CO., 110 S. Aberdeen St., Chicago



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designated as the "Integral" type,

"Flexible" type, and "All-Motor" type. In each case the gear housing acts as a support for the motor, thus assuring rigidity. In the Integral type the motor end bell is removed and the motor is close-coupled through a bayonet type of joint to the gear case. In the Flexible type the round frame type of motor is used and the end bell is retained. In the All-Motor type any standard horizontal type motor may be used, being connected through a Falk flexible coupling to the reducer housing.

All three types are supplied in horsepowers from % to 75, with ratios from 4.6 to 288. Non-planetary, helical type gears of special Falk make are used throughout. Bearings are oversize ball bearings in all but the larger sizes. Efficiency is said to be a minimum of

97 per cent.

Louis Allis Rapid Reversing Squirrel Cage Motors

Rapid reversing squirrel cage motors capable of as many as 60 reversals per min. continuously without overheating



Louis Allis Open Horizontal Ball Bearing Squirrel Cage Type Reversing Motor.

are now being made by The Louis Allis Co., 425 East Stewart, Milwaukee, Wis. Considered impossible until recently. such high rates of reversal have been

made practical through light - weight rotor construction, efficient ventilation. high torque characteristics, and shockresisting cast iron frames.

The motors are advantageous for use with practically any machine that util-



Rolled Shell Shaftless Squirrel Cage Type.

izes a fast reciprocating or reversing motion for frequent stopping and starting, such as a tapping machine, broach, slotter, shaper, or miller, and eliminates shifter clutches, tripping mechanisms, gears, and belts for reversing the spindle.

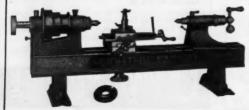
Louis Allis rapid reversing motors can be furnished in the standard open ball bearing type or rolled shell shaftless type as shown in the accompanying illustrations, and in vertical, singlespeed, multi-speed, enclosed fan-cooled, and other squirrel-cage types. No auxiliary ventilation is needed in sizes up

to 5 horsepower.

Norma-Hoffmann Duplex "Precision" Ball Bearing

The Norma-Hoffmann Bearings Corporation, Stamford, Conn., announces an addition to its line of "Precision" bearings in its Type "CD" Duplex Dou-ble Angular Contact Ball Bearing. This unit has been developed to meet the need for a bearing adapted not alone for radial loads but also for high thrust loads in either direction, with a width no greater than that of a standard single-row ball bearing.

HJORTH PRECISION BENCH LATHE



in the shop-toolroom-production and experimental departments will give you speed, accuracy, long service and satisfaction. Write for catalog and see its patented features.

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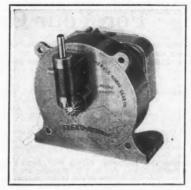
The "CD" outer ring is made in two parts, and both inner and outer raceways are ground to a special curvature for safely carrying end thrust. A onepiece ball retainer of extruded bronze rides, or is carried, upon the ground flanges of the inner ring. The "CD" Duplex Bearing is available in the light, medium, and heavy metric series in a range from 10 m/m to 100 m/m bore. The bearing should be used only where the thrust load exceeds the radial load, and the duplex outer ring should be clamped tight in the housing.

Merkle-Korff Gear Speed Reducer With Integral Motor Drive

A small speed reduction unit with an enclosed motor drive has been placed on the market by the Merkle-Korff Gear Company, 215 N. Morgan Street, Chicago, Ill. This unit, which is shown in the illustration, has a wide range of application due to its compactness and that it can be adapted to any device or mechanism. The overall dimensions are: height, 31/2 in.; width, 31/2 in.; depth, 2% in.

The unit can be supplied for practically any speed desired, from motor speed of 3,000 r. p. m. downward, and is available for either clock-wise or counter clock-wise rotation. Both horizontal and right angle drives can be furnished. Right angle drives are available with the output shaft in any position around the 360-degree circle.

An induction motor of the shaded pole type or a synchronous motor is provided, although where required the unit can be supplied with the universal



Korff Small Speed Reduction Unit with Integral Motor Drive. Merkle-Korff

motor for D. C. applications. The gear housing is neatly designed, and the gears run in grease which is sealed in, insuring positive lubrication and quiet operation.

"Murex" Heavy Mineral-Coated Electrode Catalog

A book that discusses the properties and advantages of "Murex" electrodes for arc welding has been published by the Metal & Thermit Corporation, 118 Broadway, New York, N. Y. The various types of Murex electrodes, for welding different kinds of materials, are illustrated and described and the features of each are outlined. Illustrations are included of test bars that have been subjected to bending and tensile strength tests after welding. Data as to the results of the tests are given. A copy of the book may be had upon application.



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Chucks—Key and Keyless: Bulletin No. 120A, issued by T. R. Almond Mfg. Co., Ashburnham, Mass., de-scribes and illustrates the line of key and keyless geared nut and ball bearing drill chucks made by this firm. Copy free upon request.

Cut Your Sawing Cost: "Lenox" hack saw blades and band saws are guaranteed to effect savings on your saw-ing operations. Write for information to American Saw & Mig. Co., Springfield, Mass.

Machine Shep Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chi-cago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other

tools manufactured by this company.

Time Study Watches: A folder containing illustrations descriptions of the split-second watches, decimal watches, and other timing watches marketed by Aristo Import Company, Inc., 12 John Street, New York, N. Y., can be had by addressing a request to the firm

"Atlas" Bench Lathe: A 9-in., screw cutting, self-contained, motor-driven bench lathe is now being built by Atlas Press Co., Kalamazoo, Mich. Write for cir-

Greenerd Arbor Presses: Catalog No. 36, issued by the Edwin E. Bartlett Co., Nashua, N. H., describes and illustrates all the various types and sizes of arbor presses made by this firm. Copy free upon request.

presses made by this firm. Copy free upon request.

Drop Forged Steel Die Sets: The economy and other
advantages of drop forged steel die sets, which are now
being made by E. A. Baumbach Manfg. Co., 1806 South
Kilbourn Avenue, Chicago, Ill., are explained in a folder
that can be had by addressing this firm.

Abrasives: Samples of "Aloxite" Brand "TP" Polishing Grains for trial may be had without charge by
addressing the Carborundum Co., Aloxite Division, Niagare Falls N. Y.

ara Falls, N. Y.

Diamond Boring: The newest methods of diamond boring all kinds of bearings, gears, motor frames, small bushings, and other similar work are outlined in a bulletin that also describes and illustrates three new diamond boring machines. A copy can be had by addressing the City Machine & Tool Works, 1521 East Third Street, Dayton, Ohio.

Comtorplugs: Interchangeable plugs for internal gaging. comovprups: Intercoangeable plugs for internal gaging, from 250 in. to 8 in. dia, and up to 24 in. in length, graduated by an amplifier to .0001 in., are described and illustrated in a circular that has been issued by The Comtor Company, Waltham, Mass. Copy free upon request.

Motorize Your Cone Pulley Lathes: An attachment that can be applied to your lathe with four boits makes it possible to motorize and modernize your lathes. Write for information to Cullman Wheel Co., 1336 Aitgeld St.: Motorize Your Cone Pulley Lathes: Chicago, Ill.

Dis Makers' Supplies: A complete line of die sets. leader pins. bushings. and other die makers' supplies are described in a book that is issued by the Danly Machine : Specialties, Inc., 2104 South 52nd Arenue. Chicago. III. Sent free upon recuest.

Economical Drilling: A high-grade, ball-bearing,

Drilling: Economical Drilling: A high-grade, ball-bearing, motor-driven drill press at an economical price is described in the Special Drill Press Circular, issued by Delta Manig. Company. 3777 N. Holton Street, Milwaukee, Wis. Copy free unon request.

Steel Spacing Washers: Milling jobs can be set up outleker by using standard snacing washers, made by Defroit Stamning Co., 3445 West Fort Street, Detroit, Michigan. Write for information. A high-grade,

Data Sheets on Threaded Parts: The Eastern Machine Screw Corporation, 140-150 Truman Street, New Haven, Conn., is now putting out sets of data sheets on threaded parts which can be had by any designer or manufacturer of threaded parts who will address his request on his firm letterhead. State whether or not the firm uses self-opening die heads.

"Speed" Spot Welders for welding metals from 0.0005 in. to 56 in. thick are described in a catalog that can be had by addressing Eisler Electric Corp., 761 South 13th Street, Newark, N. J.

The Red Liner is an automatic machine that inspects gears under conditions similar to those of actual operaand charts errors on a 200-to-1 scale. Fellows Gear Shaper Company, Springfield, Vt., for

Performance Data On Swiss Jig Borers: This 36-page pamphlet shows various types of jobs from a power showl turntable jig to a television disc, drilled and bored on Societe Genevoise High Speed Precision Borers, giving data as to size of holes, accuracy and time savings. Free upon request to The R. Y. Ferner Co., 1008 K Street, N. W., Washington, D. C.

Stampings of any kind or size can be obtained from Gerding Brothers, 5 East Third Street, Cincinnati, Ohio.

Write for particulars.

Ball and Roller Bearings, either journal or thrat, for all purposes and in all sizes, are described and illustrated in catalog No. 9 which has been issued by The Gwilliam Company, 360 Furman Street. Brooklyn, N. Y. Copy free upon request.

Precision Bench Lathe Work can only be done on finely-built, accurate machines. The complete line of Hjorth Precision Bench Lathes is described and illustrated in a catalog that has been issued by Hjorth Lathe & Tool Company, 60 State Street, Boston, Man. Copy free upon request.

Hust Drill Index: To select the right drill is easy when you have a Hust Drill Index, made by The Hust Marige Company, 128 East 10th Street, St. Paul, Minn. Ask for circular.

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202 Richmond Street, Providence, R. I., is now making
a chuck that is oil and waterproof, and is designed to
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Threading Machinery: Complete catalogs of individual Complete catalogs of monitoring bulletins covering the pipe threading and cutting machines, bolt threading machines, or die heads made by Landis Machine Co., Waynesboro, Penna., may be had upon request from this firm. State size and type of machine or die head concerning which information is

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines is save time and labor has been issued by The Loganiport Machine Co., Logansport, Ind.

"Hand-ee" Grinder: A grinder for use on dies, tools, and other-fine work, made to fit the hand, weighing one nound, with plug to operate from light socket, is described in a folder that can be had by addressing the M. C. Tool Co., 120 South Aberdeen St., Chicago, Ill.

Compound Spot-Facing Tool: A spot-facing tool re-tracting, serrated roughing cutters and fixed finishing

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cutters in the same tool will break up the scale easily and do accurate work. Write for bulletin to Mummert-Dixon Co., 120 Philadelphia St., Hanover, Penna.

Sail and Roller Searing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Rearings Corporation, Stamford, Conn.

Bearings Corporation, Stamford, Conn.

"Commercial Lapping for Close Limits and High Profeetlen" is the title of a booklet that discusses and
and machine lapping, types of lapping tools and machines, workholders for machines, preparation of lapp,
preparation of work for lapping and other important
points. A copy may be had by addressing Norton Company, Worcester, Mass.

Dis Making Machines: How dies, templates, gages, sic., can be sawed out, filed, and lapped easily and ac-curately on Oliver die making machines is fully de-scribed in a bulletin issued by the Oliver Instrument Cumpany, 1430 Maumee Street, Adrian, Mich. Mailed mon request.

Good Gears of all kinds—spur, spiral, bevel, worm, hypoid—in fact. any kind or type of gear desired, large or small, machined to an excellent finish and the highest degree of accuracy, may be obtained from Perkins Machine & Gear Co., 151 Circuit Ave., Springfield, Mass. Write for estimates.

Bench Lathe Mounting and Driving Equipment: Bul-letin 120-A, issued by Rivett Lathe and Grinder Cor-poration. Brighton, Mass., contains complete descrip-tions and illustrations of modern and conventional countershaft, individual motor drive jacksbaft, and speed but motor drive, also benches, cabinets, oil pans, etc. Copy free upon request.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described

in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Steel Stamps and Marking Dles: Full information as to steel stamps, steel roller dies, embossing dies, and embossing rolls made by the Schwerdtle Stamp Co., 10 Cannon Street, Bridgeport, Conn., can be had by writing this firm.

Hardening Simple Tools and Parts: Instructions as to the hardening and tempering of small high speed and carbon steel tools and sections can be had, to-gether with a circular describing the "Electroblast" High Speed Muffle Furnace, by addressing a request to Stark Tool Company, Waltham, Mass.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, surface grinders, tool-post grinders, and bench and floor grinders is described in Catalog No. 33, published by The United States Electrical Tool Co., 2471 West Sixth Street, Clichnati, Ohio. Copy free.

Cut With Flame through steel up to 8 in. thick by using the Vulcan Flame Cutter. Uses city gas and oxygen. Write to Vulcan Engineering Corp., Jackson, Mich., for details.

Double-Life End Mills: Weldon Double-End Type End Mills, made with blades on each end, are described in Catalog No. 6, issued by The Weldon Tool Company, 1426 West Third Street, Cleveland, Ohio. Other small tools made by this firm are also described and illustrated in this catalog.

Shop Furniture: A catalog describing and illustrating all kinds of shop furniture, including benches, vises, steel stands, foremen's desks, chip trucks, steel racks for bar stock, steel tote boxes, and other equipment will be sent free upon application to The Western Tool & Manufacturing Co., 1620 East Pleasant Street, Spring-

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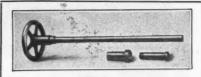
Ideas From Readers

(Continued from page 26)

the wood, but untouched as far as the lead is concerned. With the wood removed, the draftsman can then make his chisel point or other type of point to suit by the use of the sandpaper pad. The lead can be made shorter or longer, of course, by grinding the cutters as needed.







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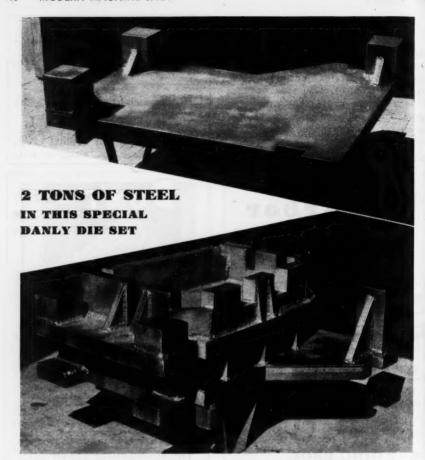
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MODEL 970 has very heavy cast-iron head, with motor mounted at rear, avoiding jack shaft. Four speeds, 590, 1,275, 2,450 and 5,000 R.P.M. Sturdy V-belt drive (belt full ½" wide); no slipping, no loss of power. Built for speeds up to 1200 R.P.M.

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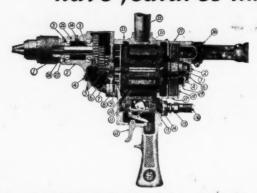
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